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A Fresh Look at the U.S./Chinese Textile and Apparel Supply Chain Question

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ABSTRACT

During the last decade of the 20th and first decade of the 21st century the economies of the United States and China became "joined-at-the-hip" in a manner that, while beneficial to both at the time, today is potentially dangerous to global financial stability and unsustainable for the future. This condition, called the Triffin Dilemma, requires a rebalancing of the U.S./Chinese economies one-to-the-other. This action brings into focus the rapid growth of technology, the resulting effects on labor employment and the distribution of wealth, and the need to incorporate these issues in a joint U.S./Chinese optimization process. A player in the rebalancing process will be the textile and apparel industries of the U.S. and China. This economic rebalancing from the view of U.S. and Chinese textile and apparel product supply chains is the focus of this paper.

Keywords: Triffin Dilemma, reserve currency, (debt/GDP) ratio, technology, Value Marginal Product (VMP), supply chains, labor employment, optimization, textile and apparel.

Introduction

In the 1980s and 1990s much of the U.S. textile and apparel industry literally picked itself up and moved to China. The conventional wisdom of the time was "never to return." The magnitude of the loss of U.S. textile and apparel production can be illustrated by using some numbers from *Textile World*[1]. For an industry loss that started in the 1980s, these numbers show that U.S. shipments of textile and apparel products experienced about a 90 billion dollar decline in just the period between 1998 and 2012 with job losses approaching a million employees. These are profound numbers! One can explain the 90 billion dollar decline in the sales numbers due to two forces. A first reason is an expanding trade deficit with China and other nations. A second reason is declining U.S. domestic demand led by the aftermath of the housing and construction market fall. Here, particularly hard hit was carpets/rugs and home furnishing products (an area of textile products less susceptible to foreign competition.) However, the same publication reports that there is a 70+ billion dollar sales textile and apparel industry that still resides within the domestic U.S. economy, is relatively healthy and has the potential for growth. Much has changed in

the global economy over the past two decades. These changes are particularly profound with respect to economic relationships between the U.S. and China and have future repercussions for not only these two nations but for the entire 21st century global economy. Part of these future repercussions will likely have a serious impact on a wide range of global textile and apparel supply chains with respect to structure and national relationships. Given these dynamics, is there the likelihood of the U.S. textile and apparel Phoenix rising from the ashes? What is the likely impact on the Chinese textile and apparel industries? What might be the magnitude, if any, of the change in U.S./Chinese relative position with respect to these industries? This paper will focus on three forces affecting U.S./Chinese economic relations as the two nations move toward the mid-21st century. The first of the three forces is something called the "Triffin Dilemma." The second force is that of the expected rampant growth of technology through-out the 21st century. The third force comes from the national need to deal with the problem of income distribution and the unemployment generated by the rampant growth of technology.

During the past two decades China has become an economic super-power while the U.S. economy began a continuing fall from a state of economic supremacy to something less than it was. This change in relative status has left the U.S./Chinese economic relationship with serious challenges for the remaining 21st century. The continuing fall of the U.S. economy from a state of economic supremacy to a state of one-among-many players in the global economy will greatly affect all players in the global economy, but will have particular repercussions throughout the U.S. and Chinese political and economic systems. The 21st century political and economic issues for the two nations will be about tensions created by a non-sustainable economic balance that was generated during the last decade of the 20th and first decade of the 21st century. During this period China provided cheap products to U.S. consumers in exchange for safe and liquid U.S. debt. In turn, U.S. consumers created a nation of "consumption" financed not by savings from its own productivity but from higher and higher accumulations of debt. It is agreed that this relationship is not economically or politically sustainable for either nation and a rebalancing of each economy, one-to-the-other is critical. This rebalancing will be centered on the issues of income distribution associated with labor employment, the use of technology as a substitute for labor employment, and finding a solution to the "Triffin Dilemma." An attempted optimization of the interaction of these three forces and their repercussions within targets for growth in national GDP (gross domestic product) and national debt will define the required rebalancing and will likely lead to the development and implementation of painful national policy decisions for both the U.S. and China. In its optimization, U.S. policy makers must reign in the "flat world" supply chain structure so positively presented by Friedman[2] and think more "buy-American." But, in a market price global economy, in order for U.S. consumers to want to "buy-American," U.S. producers must take advantage of the rampant growth in technology as it becomes not only more efficient than the use of labor-intensive processes but also more effective. Here, one generates labor unemployment and income distribution effects. In the process of carrying out the rebalancing, new relationships among U.S./Chinese textile and apparel supply chains will be defined. Thus, against the background of the success or failure of this rebalancing activity, the impact on U.S./Chinese 21st century textile and apparel chains is the focus of this paper.

21st Century Textile and Apparel Supply Chains

A supply chain is a network consisting of nodes and channels that represent the total transformation flow associated with the processes of producing product; be it a thing, a service, or a combination of both.

Network nodes can be thought of as work centers that are defined by their location, processes used to perform work and node ownership. The network branches that connect supply chain nodes are channels of information, communication, transportation and logistics and are also defined by location, processes used to perform work, and channel ownership. Textile and apparel supply chain nodes comprise the fiber and yarn forming processes, fabric production processes, product forming processes, the distribution processes for final products and the integration of two or more of these activities. The channels of information, communication, transportation and logistics support the activities of the network nodes. Textile and apparel supply chains service a vast number of different product markets that include industrial, carpet and home furnishings, apparel, and numerous other product variant applications. Here, market strategies for supply chain design and control are diverse across consumer, product, process, supply chain and supply chain support needs. Cooper[3] goes into some detail to define particular aspects of textile and apparel supply chains, their nodes and channels in his paper *Textile and Apparel Supply Chains for the 21st Century.*

Supply chains can cut across a wide range of designs and properties but, in general, supply chains may be defined by their life expectancy as either "fixed" or "virtual" supply chains and/or combinations of both. A fixed-vertical design might consist of narrow-to-single ownership control exercised over most or all of the network production and distribution nodes and the channels linking these nodes. At the other extreme a virtual design might be formed around a group of independent suppliers who bond together by a common willingness to cooperate with each other over a given time period as a method to exploit given market needs within given market mechanisms. Under more optimal conditions of participant cooperation, partnership, and technology exploitation virtual designs can be both efficient and effective in their flexibility to meet rapidly changing market demands. On the other hand, under conditions of adversarial and/or poor participant cooperation and/or non-optimal use of technology, virtual designs can be very difficult to define, control and coordinate in an efficient and effective manner. Combinations of fixed-vertical and virtual design extremes are often developed as an optimal trade-off between the two extremes. Here, ownership focus on supply chain nodes and channels is on the core competences of a given set of supply chain nodes and channels acting as a total value producer for a given supply chain. A given supply chain may be built around a fixed-vertical set of nodes that define the core competence that best marries with market consumer strategy. Here, independent ownership of network nodes to complete the supply chain design is added virtually to complete the design. In his book *The World is Flat* Thomas Friedman[2] relates his discovery of global supply chains, how they work, and how pervasive they have become to the 21st century global economy.

Except for the distribution portion of textile and apparel products in the U.S., the dependent demand portion of these 21st century global chains can hardly be described as efficient or effective. Non-optimal inventories, lead times, transportation, service levels are overcome by government subsidies, currency manipulations, non-payment of social costs, etc. in the name of maintaining high employment levels using cheap, labor intensive production processes. This lack of supply chain innovation within textile and apparel production is a product of its national usefulness in providing employment. The post-World War II textile and apparel supply chains serving U.S. markets were controlled by a complex mix of market and non-market forces. The Employment Act of 1946 passed the U.S. Congress and placed the U.S. Government in a policy role of maximizing employment in the United States. As industries using labor-intensive processes within their supply chain structure, textile and apparel firms benefited from complex systems of

government trade protection and supply-side subsidy. Complex tariff and quota barriers to market entry protected domestic production demand side. On the supply side, in addition to material cost subsidies for inputs such as cotton and energy, a lax policy of social cost control for cotton dust, noise, consumer safety, control of water and air emissions among other environmental issues did not require producers to pay the full-cost of production. These U.S. government policies of trade protection and subsidy perpetuated a non-sustainable long-run textile and apparel industry structure of thousands of small under-capitalized firms whose survival was dependent on the government policies of the day. The non-sustainability of this structure received continuing support from U.S. government policy until well within the 1980s.

During the 1980s several different forces began to come together within a rising global economy. A first force of profound interest was that China and other Asian economies coveted the U.S. domestic textile and apparel markets as a way to employ large numbers of workers in low-skilled labor-intensive production processes. They desired these markets to the point that they were willing to go to great lengths both economically, socially and geo-politically to acquire them. A second force that became important within the 1980s was the changing U.S. government attitude towards the payment of the "social costs" by U.S. firms. In the 1980s much of U.S. textile technology used by existing U.S. firms was incapable of meeting the minimum noise standards, dust standards, air and water emissions standards, product liability standards, etc. To meet these standards investment capital was required. But for hundreds if not thousands of small under-capitalized firms this investment capital did not exist. Cooper[4] argued that in the 1970s less than one-fourth of the U.S. textile and apparel firms in the U.S. were capable of survival in the absence of government subsidy of one type or another. These conditions did not present a problem for the Chinese and other Asian governments. The opportunity for employment was of prime concern. The above two forces generated the "hand-writing on the wall" for much of the domestic U.S. textile and apparel producers. These firms had assets. They had low-technology machines that could be used in Asia with similar supply chain designs where textiles and apparel production was to be maintained using low-skilled labor processes within the absence of social cost restrictions. Many of the firms also owned valuable real estate that had high opportunity costs during the growing real estate development of the U.S. 1990s. It can be argued that many small under-capitalized U.S. textile and apparel firm owners experienced a net gain by being out of the textile and apparel business during the 1990s and beyond as their supply chain structure was exported to 21st century China, Asia and other global economies.

Background to U.S. Triffin Dilemma Re China

In the late 1970s and early 1980s China began an approach to economic reform that became spectacularly successful during the last decade of the 20th and first decade of the 21st century. These early reforms set the Chinese economy on a path to economic growth rates during the 1980s, 1990s and 2000s that averaged about 9% yearly. These growth rates were able to absorb about a 30% increase in population and still generate about a 20-fold increase in the average Chinese standard of living. The policies that generated this economic growth followed a very gradual increase in the quantity of freedom for entrepreneurial activity with expanded incentives for group, if not personal, ownership of property. Most of the Chinese economic growth of the 1980-2010 period was based on cheap and plentiful labor, combined with high levels of investment in production processes such as textile and apparel processes that were compatible with the cheap labor supply. The import of textile and apparel production processes, as earlier practiced by thousands of small under-capitalized U.S. textile and

apparel firms in post-World-War II America, represented a "good fit" for a portion of the Chinese economic strategy of the period. China's migration of workers from farms to industry fueled the labor supply for industrial production. Town and Village Enterprises (TVEs) supported by government and private capital flows allowed for the generation of small economic units using private market incentives. The TVE's production units were linked in supply chains by government and private brokers/agents with the ability to supply a variety of manufactured products across several disparate industries including textiles and apparel. The growth was also enhanced by government manipulation of currency exchange rates in international trade, and a hands-off attitude towards the social costs of product production.

The early period of Chinese economic reform was not a good time for the U.S. economy. During the 1970s, 1980s and into the early part of the 1990s it appeared that whatever could go wrong with the U.S. economy did go wrong. Deep recessions, double-digit inflation, and close to double-digit unemployment defined the period. During this period the U.S. economy became fundamentally aware of competitive challenges to a broad cross-section of its domestic industries from foreign producers of products. Not only low wage industries such as textiles and apparel were under threat but the period saw a number of U.S. industries under threat from high wage, technology intensive, competition from Japan. Also, middle-wage price competition from Mexico and other countries encouraged dislocation of a range of U.S. manufacturing firms from domestic production. In addition, across all U.S. industries, the threat of energy cost increases from the OPEC oil producing countries were much on the mind of energy resource users. Thus, in the 1970s and 1980s the annual rate of U.S. economic productivity slowed and the ratio of accumulated federal debt to GDP began to grow in the 1980s for the first time in decades. U.S. domestic industrial production and capital began to flow to more competitive foreign uses as the world was seeing the birth of the global economy of the 21st century. These economic conditions set the stage for the Triffin Dilemma.

The Triffin Dilemma

Earth quakes are often preceded by shocks that portend a coming disaster. One might consider the U.S. financial crisis of 2007- 2008 that threatened the world economy as a warning signal of events to come. In a speech of 29 March 2009 titled *Reform the International Monetary System*[5] the governor of the People's Bank of China, Zhou Xiaochuan, pointed to the Triffin Dilemma as the root cause of the international financial crisis of 2007-2008. If Zhou's assessment is correct, then economies of the U.S. and China stand on the fault-line of the next global economic earth quake. Much of the problem of the Triffin Dilemma is tied to what is considered an unsustainable economic relationship between the U.S. and Chinese economies. The "Triffin Dilemma" is named for a Belgian-American economist, Robert Triffin. As early as 1961 Professor Triffin argued that national economic supremacy will, over-time, sow the seeds of its own destruction. The Triffin Dilemma comes into play as any one nation takes on the responsibility of supporting other growing national economies by being the sole supplier of "safe" assets required to act as a safety net for risky investments in those growing developing economies.

Rodrigues[6] gives a very understandable discussion of a complex economic relationship between the U.S. and China in his work *China, India, and the United States; the Future of Economic Supremacy*. He points to the fact that the U.S. and Chinese economies have over the past two decades allowed their economies to be "joined at the hip" in a way that is not only long-term unsustainable but is dangerous to the economic and political stability for the world. One can argue that the political stability of China is tenuous and

based on economic growth rates that must continue to provide high employment rates. It is argued that for about two decades U.S. consumers have accommodated the needed Chinese growth rates by the purchase of Chinese exports to the U.S. economy. Here, the Chinese have made their exports too attractive for U.S. consumers to refuse. In addition to the use of production processes that take advantage of its supply of low-skilled labor, this condition has been accomplished by a number of price manipulation devices. First, China has been able to control its nominal exchange rate between the dollar and Yuan such that the buying power exchange rate greatly favors U.S. purchases of Chinese products. Second, in many cases the prices of Chinese products are directly and/or indirectly subsidized; directly by the Chinese government or indirectly through the non-inclusion of social costs into consumption prices. Over time, these practices have generated conditions where, today, the Chinese economy and its on-going economic growth rates are significantly dependent on the on-going ability and willingness of U.S. consumers to buy Chinese products. From the U.S. economy point of view continuing support of the practices that have sustained the Chinese economic growth over the past two decades is unsustainable for the future.

At the end of the 20th century the United States occupied an historically significant economic position relative to other national economies around the world. In practice, it had no real economic rivals. In an era of technology growth, it dominated the field. The U.S. was the accepted economic power of the world and the U.S. dollar was the standard for "safe" assets. Thus, as the economies of China, India, Korea, Taiwan, Southeast Asia, etc. grew at rapid rates their central banks demanded increasingly large quantities of U.S. assets denominated in U.S. dollars as reserve currency hedges against risky investments and market variability. Central banks for all nations hold reserve currencies as hedges against risk and variability in world market conditions that operate over time. These buffers are also used to gain favorable positions in pricing of national products through the ability of national central banks to use these reserves within the international currency exchange markets. Since these buffers are a store of value, it is important that they are held in assets that are "safe." During the late 20th and early 21st centuries no assets were more "safe" than U.S. assets. However, reserve currency assets not only need to be safe, they need to be liquid. The liquidity requirement requires that these safe assets must also be convertible into spendable form quickly without losing significant value. These safe and liquidity characteristics were aligned with the characteristics of U.S. government debt instruments. Here, U.S. Treasury debt instruments became the standard for economic reserves held by the growing national economies. Thus, as a part of being economically supreme the United States accepted the responsibility of becoming the provider for the world's reserve currency. Here, being the world's supreme economy had its advantages. With an ever-increasing demand for U.S. Treasury bonds, the resulting funds flow into the U.S. economy generated low interest rates. Here was a source of cheap capital for the U.S. economy. If used wisely by U.S. investors, significant advantage could be accrued to the U.S. economy and its population. However, these are borrowed funds that represent obligation to foreign central banks. These funds follow the same rules of debt accumulation that private individuals must follow. The ratio of debt to assets is fundamental in determining how much debt one individual or one national economy can bear before additional debt becomes untenable. With the massive growth of the Chinese and other world economies and a relatively slowing growth of the U.S. economy, at some point the ratio of growing rate of U.S. government debt to a declining rate of GDP (gross domestic product) becomes untenable for the political and economic health of the U.S. nation. A further complication comes from the requirements that these borrowings of

savings from foreign central banks must meet the test of liquidity. These are not long-term loans. Investment possibilities from these funds for long-term investment projects such as infrastructure development are limited. Thus, increasing growth in U.S. client economies such as China implies ever-increasing borrowing for the U.S. and the need to find ever-increasing places to allocate capital that can meet adequate return/liquidity requirements for that capital. One disastrous result of the U.S. struggle to find places to allocate these funds can be argued to have resulted in the U.S. mortgage bubble. One can argue that the borrowed funds had to be stuffed somewhere and the U.S. mortgage market was one outlet, albeit a disastrous one for those responsible for the capital. One can argue that as the U.S. economy slows there are fewer alternatives uses for these funds that must be both safe and liquid and adjustments must be made. These adjustments are significant and critical to the economic health of the world. Currently the U.S. and Chinese economies represent over 40% of the world's GDP. The stability of each of these two economies currently depends one-on-the-other as does the stability of the global economy. It is understandable that the governor of the People's Bank of China, Zhou Xiaochuan is concerned. Zhou Xiaochuan[5] as the governor of the People's Bank of China has proposed changes in the actions of the International Monetary Fund, IMF. Here, Zhou calls for a gradual movement away from the U.S. dollar as the global reserve currency to be replaced by the IMF's special drawing rights (SDRs). Economist C. Fred Bergsten[7] writes in a November 2009 article of *Foreign Affairs Magazine* that some type of global reserve currency within the IMF would be in the best interests of the U.S., China, and the world. However, the inertia associated with the world depending on U.S. dollars as the source of reserve exchange is great and change from this state is considered with fear by many. Thus, while there is support for some type of international movement away from the U.S. dollar as a reserve currency, the form of that movement is not well understood and it is agreed that any movement must be made with caution.

Employment, Technology and the VMP Method for Determining Income

The rate of technology advancement in developed countries is expected to accelerate into the mid- 21st century creating a need for a re-thinking of employment policy and methods for determining income distribution. It is agreed that the 21st century will see innovations in technology that will enhance both supply chain efficiency and flexibility. Information, communication, transportation, and logistical technologies coupled with "mass customization" techniques and process innovations in market economies will result in a continuing movement away from labor as a resource for product production to resource mixes that contains more capital intensive technology. Condon and Wiseman[8] speak to the massive and pervasive impact that technology is having and will continue to have on employment in developed economies of the 21st century. They make the point that during the first decade of the 21st century labor employment jobs are "being obliterated by technology." In another of their publications[9] they raise the question of U.S. and other developed economies being prepared for a condition where as many as 50% of its working population is without jobs. It is argued that past innovations in "labor-saving" technologies have, in the long run, created more new jobs than the old jobs replaced, although generating labor market disruptions in the required transformation of needed labor skill levels. However, Ford[10] points to the continuation of this trend with millions of future job losses to technology as technology becomes more sophisticated and an ever-increasing part of daily life. It is argued that unlike the past the growth in the comparative advantage of technology over labor as a means of production will be pervasive. The advantage cuts across both manufacturing and service industry products and will have

profound effects on the way capitalist nations deal with these effects. In this environment as demand for non-technology-based labor declines with its resulting income effects, profits associated with technology and its supporting capital rise. It is argued that the developed nations of the world are likely to face increasing tensions of income distribution effects that could lead to social unrest, divisive and disruptive political environments and falling living standards for major portions of the population.

Market economies link production processes to income distribution via the price mechanism. An introductory text book in microeconomics speaks to the role VMP (value of marginal product) has in income determination in a market economy. Here, the returns to production resources are determined by the value of the contribution that resource has to the value of the product being produced. These values are production process specific and associated with the relative market prices for the resources used with a given production process. In the absurd case where one machine and one laborer could produce all the output for a market economy, the VMP method of income distribution would allocate all the output to the owners of the machine and the person that operates the machine. This absurd example calls into question market solutions as related to income distribution under conditions of technology growth as the world moves toward the mid-21st century. Here, in the face of social tensions created by a growing disparity of income distribution, under the VMP pricing mechanism the national policy incentives might lead to less efficient, effective and value oriented production processes as a method for spreading the wealth via income distribution. One the other hand, an alternative policy might be adopted that optimizes production processes for efficiency, effectiveness and value but requires developing new non-VMP methods for determining income distribution.

The explosion of technology during the 21st century has and continues to create both economies of production flexibility and scale at the same time and, over time, is progressing towards obsoleting labor intensive production processes both in producing things and services. This process is directed towards decreasing the aggregate demand for human labor numbers relative to capital intensive technology. Here, it follows that a redirection of human efforts towards designing and using technology with smaller relative human employment numbers is in the future for capitalist nations. What is the magnitude of this trend? Will enough new jobs be created to sustain the VMP approach to output distribution and prevent civil unrest between a widening gap of a few "haves" and a greatly expanding number of "have-nots?" The wrong answer is highly problematical and dangerous for the future.

Optimizing Across the Triffin Dilemma, Technology and Labor Employment

Over the past two decades price attractive Chinese products has led to ever-declining U.S. manufacturing, increased emphasis on services, and an economy based on debt financed consumerism. However, as the U.S. and China move through the second decade and toward the mid-21st century, it is accepted that the U.S. has reached a limit with respect to debt financed U.S. consumerism. How the U.S. economy optimizes its future economy as it reacts to this condition will have a significant effect on China and the world's global economy. A partial solution for the U.S. economy to right itself is to force a change in the direction of the flows of products and capital between itself and China. This can be accomplished by buying less from China, producing more of its own consumption value internally and creating more of its own capital from domestic private savings, thus depending less on China and the world to finance its investment and consumerism. Here, the implication for supply chains serving the U.S. economy point to node and channel location, ownership and process. This reaction to the problems of the Triffin

Dilemma would require supply chain nodes and channels serving the U.S. economy to redirect more of the nodes and channel linkages toward increasing U.S. produced product value and the economic growth resulting from the internal production of that value. This approach is at odds with the concept of a flat world as celebrated by Thomas Friedman[2] in his book *The World is Flat*.

Rodrigues[6] and Taylor[11] discuss U.S. alternative solutions to the Triffin Dilemma and lead the reader to the conclusion that greatly increased internal ownership of U.S. supply chain value is more than an alternative but a required policy action. The 21st century demands for U.S. domestic investment funds will generate a competition among both government and private investment needs for scarce investment resources. The sources for all investment funds will be either savings or debt. Savings come from private savings and/or positive trade balance funds. Debt comes from private debt and/or negative trade balance funds supported by foreign debt. One can argue that increased U.S. national debt-financed investment for the U.S. economy is not a 21st century option. Today one can argue that in practice little can be done to reduce the U.S. government debt without a significant disruption to the social fabric of the nation. In the mid-2000s the U.S. government debt/GDP ratio was about 40% but mainly because of looming gaps projected in Medicare and Social Security and the perceived need for maintaining defense spending, the debt/GDP ratio for 2050 is projected to be as high as 100%. It can be argued that during the 2010-2050 period significant reductions in U.S. government spending or substantial increases in taxes are unlikely and the resulting deficits and growth in national debt from this scenario are unimaginably large. Thus, significant U.S. policy action is required. If reduction of government expenditures and/or increases in taxes is not the answer to supplying additional investment funds to support future U.S. economic growth and reduced government/private debt, then what is left? It follows that it must be increased U.S. domestic created value that is the key to breaking the Triffin dilemma for the U.S. economy.

The above "buy American" approach has profound effects re the Chinese economy. For China's part, its reaction is unknown at this point but one can forecast that a likely reaction will be to redirect its economy away from U.S. exports towards the development of its own internal markets and social structure. This likely will include less emphasis on heavy-industry that is designed to support exports to include a greater emphasis on developing a balance of domestic consumption and provisions for services. Here, redirection likely includes increased emphasis on consumption of its own manufactured and service products. One would expect service products such as education, health care, and social security for the elderly to be a priority. Also, as the emphasis in the Chinese economy shifted to heavy industry its demand for energy and natural resources increased dramatically with resulting high levels of pollution and unpaid social costs. One would expect an additional priority would address social cost issues. In general, one can argue that the proper replacement for the inevitable loss of Chinese exports to the U.S. will generate relative growth in domestic Chinese consumption of a balanced mix of domestic produced goods and services. Taken together, more government emphasis on the domestic needs for the large Chinese population and a redirection of consumption to domestic markets will require a stable Chinese banking system. As the Chinese central bank reduces its accumulation of reserves through the process of "pegging" the Yuan to the U.S. dollar, Chinese exports will tend to decrease and imports will tend to increase as the value of the Yuan tends to rise against the value of the U.S. dollar.

Much of the world's 21st century economic practice, more or less, uses price-oriented market principles in the management of its economic systems. It is this philosophy that has generated the

notable growth rates for the Chinese and other Asian economies during the past two decades. But these price incentive methods used by the Chinese and Asian trading partners can hardly be called "free-market" in practice. From a "free market" point of view, the U.S. and its trading partners don't always play on a level playing field. In the face of unbalanced tactics used by its trading partners, one might consider ways the U.S. economy can overcome these tactics and exploit any advantages it might have to generate increased growth and decrease its debt/GDP ratio. How about technology? In the development and application of technology the U.S. economy has a comparative advantage relative to other national economies. It is argued that this advantage should be exploited. The National Economic Council Director, Gene Sperling[12], points to the U.S. need to exploit its technology advantage through the development of a strong U.S. manufacturing sector. He argues that the U.S. must retain the knowledge spillovers resulting from manufacturing as a means to retain its advantage in technology utilization in the future. He points to the need to use U.S. manufacturing as a hub that supports and extends the web of surrounding supply chains of U.S. producers of things and services. Government policy that supports the expanding development and use of technology as a means of gaining relief from the Triffin Dilemma represents a viable alternation for the U.S. economy. However, in developing its optimization policy, U.S. policy makers must deal with the negative impact that technology adoption might have on labor employment levels. In its policy decisions trade-off consequences of supporting policies that encourage increased production efficiency, effectiveness and product value through technology substitutes for labor must be balanced against disruptions in the labor economy and resulting unemployment. Here the policies associated with the optimization process are likely to be painful for certain segments of the U.S. economy, but can be strongly argued as necessary for future global political and economic stability.

Textile and Apparel Supply Chains in the U.S./Chinese Economic Rebalancing Process

As Sperling[12] calls for government policy to rebuild manufacturing in the U.S. the Boston Consulting Group[13,14] (BCG) forecast that, absent government policy changes, existing market forces will cause selected U.S. produced manufactured products to become increasingly attractive to both domestic and foreign consumers. They point to rising wages, transportation costs and land prices in China along with the expected strengthening value of the Chinese currency as reasons for a relocation and expansion of U.S. manufacturing from China to the domestic United States. As U.S. wage rates decline or their rate of growth slows, as labor productivity increases with technology-based processes, as the U.S. workforce becomes more flexible, and as the value of the dollar weakens relative to the Chinese currency, the BCG[13,14] expects to see companies begin to bring more capacity into the domestic U.S. to service, in particular, North American consumers. The BCG[13,14] argues that when all costs for product production and distribution are considered, states such as South Carolina, Alabama, Tennessee and other Southern states may be among the least expensive production sites for certain manufactured products in the industrialized world. The Economist[15] also speaks to the movement of U.S. manufacturing from China back to the U.S. economy. It points to the U.S. advantages in energy and transportation costs. It points to U.S. advantages in the use of technology as a means for manufacturing cost reduction through productivity. The BCG[13,14] reports point to industries using production processes that contain small labor costs and demand flexibility in product production as prime candidates for relocation from China. They give little consideration for the U.S. relocation of companies that produce textiles in support of

apparel production and forecast these supply chain nodes will move from China, not to the United States, but to developing economies using low-skilled labor processes.

In a market economy supported by government policies aimed at concentrating manufacturing supply chain nodes and channels within U.S. ownership hands, conventional wisdom about textile and apparel production processes may have to be rethought. Cooper's[16] paper *The US Textile Industry Renaissance of 1960-80*, details how two firms, Burlington Industries and Milliken and Company staked their future on their ability to turn textile and apparel production into a materials, energy and technology based industry, all three of which the BCG[13,14] points to as areas where U.S. production will have comparative advantage in the coming 21st century. He argued that absent government subsidy, currency manipulations, and other non-free market forces at work, textile and apparel supply chains would reside within the domestic U.S. economy as materials, energy and technology intensive supply chain nodes and channels. He argues that these firms were not incorrect in strategy but ahead of their time, in the wrong place at the wrong time. During the exodus of the textile and apparel industry Cooper and Conrad's[17] 1986 paper, *Going Head to Head with Imports and Winning* details the areas of industrial, carpets and home-furnishing textile products as being "safe," in the absence of foreign government subsidies and currency manipulations from foreign competition, because of materials, energy, transportation and technology advantages of domestic U.S. producers. These are areas of textile production that *Textile World*[1] report to be alive and well in 2013 in the face of on-going Chinese government subsidies and currency manipulations, and have the potential for growth in supplying North American markets. However, U.S. domestic production of yarns and fabrics for apparel, and the apparel production component itself, has been at a competitive disadvantage with foreign competition for a number of decades. This competitive disadvantage centers on the cost disadvantages of textile apparel production in the U.S. that are generated by the accepted labor-intensive production processes that utilize cheap labor. These advantages are enhanced with on-going Chinese government subsidies and currency manipulations. Because of the Chinese competitive advantage in the apparel forming process there is an incentive for supporting yarn and fabric nodes to locate in proximity to the apparel forming nodes of a given supply chain. One can argue to return textile apparel production to the domestic United States the apparel-forming processes must be made technology intensive.

Using some of its clients, as early as 1981, the consulting firm *Operations Analysis Company* (OAC) was experimenting with the use of virtual, fixed-path, sewing machine lines in the production of apparel products. It was understood that the classic "traveling bundle" process was at the center of excessive in-process inventories, long lead times, and high production costs. The "traveling bundle" process is one where cut fabric parts travel in a bundle along a variable path through a series of sewing operations, specific to that product, until product completion. The OAC experiments were about developing and implementing virtual, fixed-path, balanced, product-based sewing lines using mobile sewing machine processes. Here, the goal was to obtain the productivity, lead time and cost advantages of balanced assembly line flow and still maintain the product-mix flexibility of a variable path process. The concept was ahead of its time for U.S. adoption with respect to information, communication, work force management skills, sewing technology and machine/operator mobility. However, today, the basic OAC concept of virtual sewing lines offers a productive way of turning apparel production into a technology-based industry that is competitive in both cost and flexibility with labor intensive alternatives. Here, in addition to the areas of industrial, carpet and home furnishings products, one

might include textile apparel products as a growth area of U.S. manufacturing.

Government policies to return manufacturing to the U.S. economy such as those advanced by Sperling[1] do not fully address the U.S. problems of unemployment and income distribution. Today, only about 12% of the U.S. private-sector workforce is employed in manufacturing. To return and grow textile and apparel in the U.S. does not imply a return to the employment opportunities of the 20th century. A return of textile and apparel production and any other manufacturing supply chain nodes and channels to the U.S. is about competitive advantage through technology, transportation, lead times, quality, and customer service. Unemployment problems are optimized within the restrictions of the Triffin Dilemma and the rapid growth of technology alternatives to labor. Whether the VMP pricing theory holds for a world of rampant growth in production technology into the mid-21st century is today an open question.

In the mid-1970s a small number of well capitalized textile firms acted on a belief that in the face of significant price disadvantages with foreign competition it was possible to prosper in the coming global economy through the efficient and timely adoption of technology. These firms invested heavily in the chemical, mechanical, information and logistics technology of the time in concert with new forms of supply chain designs as a survival strategy. By the mid-to-late 1970s two large textile firms, Burlington Industries and Milliken and Company had obtained a dominant position in the industry with this strategy. In a 1976 report for the U.S. Treasury Department's Office of Industrial Economics, Hudak and Bohnslav[18] reported that these two firms had gained a significant competitive advantage over other its existing competition both domestic and foreign. The report pointed to the successful development of complex vertical and/or horizontal supply structures that allowed for significant gains in flexibility, diversification and financial strength. Much of the success of the Burlington Industries/Milliken and Company experiment of the time was based in the belief that the *natural* state of textile and apparel production/distribution did not have to be labor intensive. The strategy of Burlington Industries was to develop a technology-based supply chain structure that was materials, energy, information and logistics intensive. Corporate Burlington Industries so believed in the optimality of their vision of supply chain design for textile and apparel supply chains that in the mid-1970s it launched a 10-year, $2 billion (*1970 dollars*) capital expenditure program, a scope of action that was unprecedented in the history of the world's textile industry as a means to achieve their design goals. The objective was to achieve a world-class manufacturing and distribution base that would positioned the company for world-wide competition well into the 21st Century. Their decision process was in the absence of significant understanding of the role of China in the 1990s and 2000s. One can argue that on a level playing field their strategy was sound. But, the playing field between the U.S. and Chinese economies was not level for textile and apparel production and distribution, thus one can only argue that their strategy was ahead of its time.

Today, modern information systems that support Enterprise Resource Planning (ERP) and Advanced Planning and Scheduling (APS) software systems allow properly structured *virtual* supply chain designs to simulate the positive control features of *vertical* chains, under conditions of node-to-node information sharing and cooperation. Today, it is possible to consolidate the *vertica*l supply chain design advantages of reduced inventories, shorter lead times, maximum work center node control and economies of scale in production and distribution within the *virtual-vertical* supply chain design model. Modern product design, process control, transport and information technology techniques gives modern supply chain management the ability to produce product flexibility through a concept called *Mass Customization*. *Mass*

Customization is about the integration of production/distribution process design and product design so as to have the ability to create customized products to-order from standardized resources within acceptable, competitive, customer waiting time costs. A number of authors speak to the need for these types of modernization methods for the Chinese textile and apparel industries. For example, Fengfei Zhou[19] in the paper *Study on the Implementation of Green Supply Chain Management in Textile Enterprises* speaks to textile and apparel industry environmental problems in today's China and the impact of supply chain design. Here Zhou speaks to the future survival and development of the Chinese textile and apparel industries. Zhou questions the Chinese supply chain designs and their deficiencies in dealing with future required innovation, product flexibility, energy and environmental costs. The ATA Journal for Asia on Textile & Apparel[20] reports on how Association of Southeast Asian Nations (ASEAN) suppliers are exploring new ways to improve competitiveness in textile and apparel industries. At the heart of their concerns is supply chain design. One section of the report is on the needed development of *"virtual-vertical integration."* In order to increase required innovation and product flexibility need, ASEAN suppliers are cooperating in horizontally linked, *vertical* supply chains consisting of independently owned supply chain network nodes. In general it is becoming clear that, like the 1970s and 80s of America, without continuing governmental and environmental subsidization of most textile and apparel products, the existing supply chain structure for textile and apparel production in the developing world will not be adequate to meet the competitive needs of the 21st century. In a free market economy one can argue that the supply chains that link textile and apparel product production in China to the distribution and consumption of those products in the U.S. are inefficient. While the nodes and channels of the distribution of products may be very efficient, the nodes and channels supporting most total supply chain structures cannot be defined as efficient. In today's global economy textile and apparel products delivered at retail from China are not so much a function of careful flow control of lead times, capacities, inventories and transportation cost through supply chain pipelines, as they are of nationally subsidized, labor intensive, production processes designed to meet some national economic and political agenda. However, one can argue that these conditions for a number of reasons will not continue to hold true into the 21st Century? If so, what is the alternative?

One can only speculate on what global textile and apparel supply chain designs will need to look like in order to meet the assumed 21st century costs of expensive energy and green environment coupled with assumed market requirements for ever-increasing demands for product variety with ever-decreasing product life cycles. It is not a far stretch to forecast that as the economies of China and other nation's mature, textile and apparel supply chains will become more technology and less labor intensive in the future. One can argue that under these conditions environment capital and information rich firms of more *virtual-vertical* chain design, using the philosophies of the Burlington/Milliken models of the 1970s and 80s in concert with 21st century technology, will dominate textile and apparel markets. Supply chain network nodes and channels will be populated by technology intensive, partners using communication and transfer pricing policies that provide win-win solutions for network node participants and optimize customer value for the supply chain. This idea is supported by the current U.S. partnership of P&G and Wal-Mart. The Graen and Shaw[21] paper about the Procter and Gamble/Wal-Mart partnership supports this thesis. In the paper the authors describe a supply chain partnership between two equals: a capital and technology rich manufacturer (Procter and Gamble) and a capital and technology rich retailer (Wal-Mart). The paper details

their win-win cooperation of information-sharing across their mutual supply chains that are making their total chain designs more efficient and better coordinated. The partnerships have resulted in increased total product sales and reduced needs for inventories. The authors point to the increasingly important need for relationships such as these, both for total supply chain product cost, flow control improvement and for increasing the volume of customization required in future commerce. One can argue that these relationships for textile and apparel supply chains coupled with new technical innovations will define the future of the 21st century.

Summary

As the global economy moves toward the mid-21st century national and global financial stability are in harm's way. The center of attention is on the U.S. as the supplier of the world's financial reserves and something called the Triffin Dilemma. The Triffin Dilemma points to the fact that as the relative growth of U.S. debt increases and U.S. GDP declines, the stability of the U.S. dollar as the world's reserve currency comes into question. Here, the two main players are the United States and China and their economic relationships. Currently the U.S. and Chinese economies represent over 40% of the world's GDP. Much of the problem with the Triffin Dilemma has evolved with the "joined-at-the-hip" relationship between the U.S. and China that has facilitated, as one can argue to its own U.S. national detriment, China taking its place as an economic giant in the 21st century. In one sentence, China has debt-financed U.S. consumerism to the point where the U.S. dollar and its economic systems are in harm's way as a quid-pro-quo for supplying employment for Chinese labor, thus maintaining a measure of political stability in China. Here, one must mention that a good number of politically powerful U.S. corporations have benefited handsomely from their investments in the Chinese economy. However, it is time to alter course with the U.S./Chinese economic relationships.

As the global economy moves towards the mid-21st century the future of the U.S./Chinese textile and apparel industries is but a small part of a large puzzle of how to rebalance an economic and political relationship between the two nations that has become unsustainable. In this profound optimization process of various disparate and/or competing issues, one might think of U.S. and Chinese textile and apparel supply chains as but small boats in a turbulent sea. However, the initial movement of labor intensive production process such as textiles and apparel has defined the U.S./Chinese economic relationship for more than the past two decades and offers a bench-mark for looking at the future with respect to economic rebalancing.

Normative economics speaks to policy issues as to what "should be done." However, what should be done is based on the "eye of the beholder" and often it is the forces of power that determine the policies as to what is done. Such will be the case with the needed rebalancing of the economic and political relationship between the U.S. and China. The position of textile and apparel production in the U.S. economy has been a government policy issue in the U.S. since the end of World War II. For a generation after 1946, with the support of U.S. government full-employment policy, textile and apparel supply-chain structures were greatly determined by government trade protection and subsidy. Complex tariff and quota barriers to entry supported the demand side. On the supply side, in addition to subsidies for materials such as cotton and energy, lax policies of social cost payments for consumer safety, cotton dust, noise, water and air pollution, and other environment issues did not require producers to pay the full cost of production. During the 21st century, relative to its textile and apparel industries, many of these policy issues became Chinese as well. In different places and different times these government policies of trade protection and subsidy have

perpetuated and defined the textile and apparel supply chain structure of the day for both the U.S and China.

What happens to the U.S./Chinese relationship in textile and apparel production in a much larger rebalancing of their economic and political relationships will see one of two scenarios. On the one hand, the rebalancing may be accomplished as an adversarial relationship where both parties use a concept of "local optimization." This approach has the potential to lead to global tensions that could lead to military options. On the other hand, the rebalancing may be accomplished as a "global-optimal" approach of cooperation, recognizing the unsustainability of their current relationship, and working together through government policy decisions and the market system to attain a rebalancing that is satisfactory to all involved parties. In either of the two cases, the local-optimal or the global-optimal approach, the future of U.S. produced textile and apparel products, like the rest of the U.S. economic and political structures, will depend to a great extent on U.S. government policy reactions to Chinese government policy actions. Whether U.S. government policy is flexible enough to react in a positive way to Chinese policy actions is today an open question. The Economist[8] speaks to the number of big public traded U.S. companies with large investments in China who oppose bills to aid the rebalancing of the Chinese/U.S. economic relationships through the reduction of currency manipulations by the Chinese banking system. They report that a number of U.S. manufacturers in China do not believe U.S. policy is doing what is needed to bring U.S. manufacturing back to U.S. shores. In addition, it is an open question if either the U.S. or Chinese economies are up to the task of maintaining economic and political stability with respect to the arriving problems of unemployment and wealth distribution generated by the technology of the mid-21st century. When Condon and Wiseman[9] raise the question of U.S. and other developed economies being prepared for a condition where as many as 50% of its working population is without jobs, the answer is probably "no." However, within this sea of potential troubles, as the market system survives, one can expect to see equilibrium, rebalancing, occur within U.S./Chinese textile and apparel production. As these two economies become more alike, textile and apparel production in both nations will be materials, energy, transportation and technology intensive. While one can expect growth in U.S. textile and apparel supply chain production in the 21st century the amount of that growth will be determined by the amount of capital flow into the technology of supply chain development. Capital and information rich firms of virtual-vertical supply chain design, using the philosophies of the Burlington/Milliken models of the 1970s and 80s in concert with 21st century technology, will dominate textile and apparel markets. More domestic and regional supply chain network nodes and channels will be populated with non-adversarial, partner, sources that provide win-win solutions for network node participants and optimize customer value for the supply chain.

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